WHAT IS CLAIMED IS:

1. A method for producing single-wall carbon nanotubes, comprising:
   (a) providing a supported catalyst of catalytic metal comprising iron (Fe) and molybdenum (Mo) on magnesium oxide (MgO) particles, wherein the catalyst has been prepared by combusting iron, molybdenum and magnesium oxide precursors to form the supported catalyst; and
   (b) contacting the catalyst with a gaseous stream comprising a carbon-containing feedstock at a sufficient temperature and for a contact time sufficient to make a carbon product comprising single-wall carbon nanotubes.

2. The method of claim 1 wherein iron and molybdenum are present in a weight ratio range from about 10 to 1 to about 2 to 1.

3. The method of claim 1 wherein the iron and molybdenum are present in a molar ratio range from about 20 to 1 to about 3 to 1.

4. The method of claim 1 wherein the catalytic metal is present on the magnesium oxide particles on a weight basis from about 0.5 wt% to at most about 10 wt% of the weight of the magnesium oxide particles.

5. The method of claim 1 wherein the iron precursor is selected from the group consisting of iron (III) nitrate, iron sulfite, iron sulfate, iron carbonate, iron acetate, iron citrate, iron gluconate, iron hexacyanoferrite, iron oxalate, tris(ethylenediamine) iron sulfate and combinations thereof.

6. The method of claim 1 wherein the iron precursor comprises iron (III) nitrate.

7. The method of claim 1 wherein the molybdenum precursor comprises ammonium heptamolybdate.

8. The method of claim 1 wherein the magnesium oxide precursor comprises magnesium nitrate.

9. The method of claim 1 wherein the combusting includes a foaming agent.

10. The method of claim 1 wherein the combusting includes at least one compound selected from the group consisting of a citric acid, urea, glycine, hydrazine, sucrose, carbohydrazide, oxalyl dihydrazide, sugars, alcohols, and combinations thereof.

11. The method of claim 1 wherein the combusting includes citric acid.

12. The method of claim 1 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 150°C and about 1200°C.

13. The method of claim 1 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 200°C and about 700°C.

14. The method of claim 1 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 250°C and about 650°C.

15. The method of claim 1 wherein the precursors are sprayed to form an aerosol prior to combustion.

16. The method of claim 1 wherein the combusting comprises contacting the precursors with a heated surface.

17. The method of claim 1 wherein the catalyst is exposed to a sulfur-containing compound.

18. The method of claim 17 wherein the sulfur-containing compound is selected from the group consisting of thiophene, hydrogen sulfide, a mercaptan and combinations thereof.

19. The method of claim 17 wherein the sulfur-containing compound comprises thiophene.

20. The method of claim 1 wherein the catalyst has a cross-sectional dimension of less than about 100 microns.

21. The method of claim 1 wherein the catalyst has a cross-sectional dimension of less than about 30 microns.

22. The method of claim 1 wherein the catalyst has a bulk density less than about 0.3 g/cm^3.

23. The method of claim 1 wherein the catalyst has a bulk density less than about 0.1 g/cm^3.

24. The method of claim 1 further comprising reducing the metal prior to the contacting step.

25. The method of claim 24 wherein the reducing is done with a reducing gas.

26. The method of claim 25 wherein the reducing gas comprises hydrogen.

27. The method of claim 1 wherein the metal is reduced during the contacting step.

28. The method of claim 1 wherein the temperature is in a range of about 500°C and about 1500°C.

29. The method of claim 1 wherein the temperature is in the range of about 650°C and about 950°C.

30. The method of claim 1 wherein the temperature is in the range of about 800°C and about 950°C.

31. The method of claim 1 wherein the carbon-containing feedstock comprises a compound selected from the group consisting of methane, hydrocarbons, carbon monoxide and combinations thereof.

32. The method of claim 1 wherein the gaseous stream comprising the carbon-containing feedstock comprises methane.

33. The method of claim 1 further comprising mixing hydrogen with the gasesous stream comprising carbon-containing feedstock.

34. The method of claim 1 wherein the gaseous stream comprising the carbon-containing feedstock also comprises hydrogen.

35. The method of claim 1 wherein the gaseous stream comprising the carbon-containing feedstock comprises a mixture of methane and hydrogen.

36. The method of claim 1 wherein the contact time is in a range of about 0.1 seconds and about 60 minutes.

37. The method of claim 1 wherein the contact time is in a range of about 0.1 seconds and about 30 minutes.

38. The method of claim 1 wherein the contact time is in a range of about 10 seconds and about 10 minutes.

39. The method of claim 1 wherein the single-wall carbon nanotubes have diameters controlled by the contact time in the contacting step.

40. The method of claim 1 wherein the single-wall carbon nanotubes have lengths controlled by the contact time in the contacting step.

41. The method of claim 1 wherein the contacting is done at a pressure between about 0.1 atmospheres and about 200 atmospheres.

42. The method of claim 1 further comprising removing the catalyst from the carbon product with an acid.

43. The method of claim 42 wherein the acid is selected from the group consisting of citric acid, acetic acid, nitric acid, sulfuric acid, hydrochloric acid, hydrofluoric acid and combinations thereof.

44. The method of claim 42 wherein the acid comprises hydrochloric acid.

45. The method of claim 1 wherein at least about 50 wt% of carbon in the carbon product is single-wall carbon nanotubes.

46. The method of claim 1 wherein at least about 80 wt% of carbon in the product is single-wall carbon nanotubes.

47. The method of claim 1 wherein at least about 90 wt% of carbon in the product is single-wall carbon nanotubes.

48. The method of claim 1 wherein at least about 95 wt% of carbon in the product is single-wall carbon nanotubes.

49. The method of claim 1 wherein the catalyst is flowed through a transport reactor entrained in the gaseous stream comprising the carbon-containing feedstock.

50. The method of claim 49 wherein at least one other gaseous stream comprising the carbon-containing feedstock is introduced to the reactor at more than one inlet.

51. The method of claim 50 wherein the at least one other gaseous stream comprises hydrogen.

52. The method of claim 49 wherein the reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

53. The method of claim 49 wherein the reactor further comprises a solid-gas separator selected from the group consisting of a wet scrubber, a cyclone, an electrostatic precipitator, filter, and combinations thereof.

54. The method of claim 49 wherein a dispersing aid is used in the transport reactor.

55. The method of claim 54 wherein the dispersing aid is a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

56. The method of claim 1 wherein the catalyst is fluidized by the gaseous stream comprising the carbon-containing feedstock in a fluidized bed reactor.

57. The method of claim 56 wherein the fluidized bed reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

58. The method of claim 56 wherein a fluidizing aid is fluidized in the fluidized bed reactor.

59. The method of claim 58 wherein the catalyst and the carbon product are separated from the fluidizing aid by differential elutriation.

60. The method of claim 58 wherein the fluidizing aid exchanges heat with the catalyst.

61. The method of claim 58 wherein the fluidizing aid acts as a reactor wall scrubber.

62. The method of claim 58 wherein the fluidizing aid is a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

63. The method of claim 1 wherein the contacting occurs in a moving bed reactor, wherein the reactor has a moving bed comprising the catalyst and essentially-inert particles.

64. The method of claim 63 wherein the moving bed reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

65. The method of claim 63 wherein the gaseous stream comprising the carbon-containing feedstock is introduced into the reactor at more than one inlet.

66. The method of claim 63 wherein the essentially-inert particles comprise a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

67. The method of claim 63 wherein the essentially-inert particles are removed from the reactor, circulated and re-introduced to the reactor.

68. The method of claim 63 where the essentially-inert particles are regenerated after exiting the reactor.

69. The method of claim 63 wherein the essentially-inert particles are heated after exiting the reactor to produce essentially-inert heated particles.

70. The method of claim 68 wherein the essentially-inert heated particles are introduced into the reactor and exchange heat with the catalyst.

71. The method of claim 63 further comprising separating the catalyst and the carbon product from the essentially-inert particles.

72. The method of claim 71 wherein the separating is done by differential elutriation.

73. The method of claim 71 wherein the separating comprises a component selected from the group consisting of a cyclone, a classifier, a solid-gas separator, a disengaging section, a wet scrubber, a cyclone, an electrostatic precipitator, a filter and combinations thereof.

74. The method of claim 63 wherein the moving bed reactor is a counter-current moving bed reactor, wherein the counter-current moving bed reactor has a moving bed comprising the essentially-inert particles that move in a direction counter-current to flows of the catalyst and the gaseous stream comprising the carbon-containing feedstock.

75. The method of claim 63 wherein the moving bed reactor is a concurrent-flow moving bed reactor wherein the essentially-inert particles and the catalyst flow in the same direction.

76. The method of claim 75 wherein the gaseous stream comprising the carbon-containing feedstock, the essentially inert particles and the catalyst flow in the same direction.

77. The method of claim 75 wherein the gaseous stream comprising the carbon-containing feedstock flows in an opposite direction to movement of the essentially-inert particles and the catalyst.

78. A method for producing single-wall carbon nanotubes, comprising:
   (a) providing a catalyst of catalytic metal comprising at least one metal from the group consisting of Group VIB and Group VIIIB and a support selected form the group consisting of alumina, magnesia, silica, zirconia and combinations thereof;
   (b) sulfiding the catalyst; and
   (c) contacting the catalyst with a gaseous stream comprising a carbon-containing feedstock at a sufficient temperature and for a contact time sufficient to make a carbon product comprising single-wall carbon nanotubes.

79. The method of claim 78 wherein the catalytic metal comprise Co and Mo.

80. The method of claim 78 wherein the support is magnesia.

81. The method of claim 78 wherein the catalyst is prepared by combusting precursors of the catalytic metal and the support.

82. The method of claim 81 wherein the precursors are combined with a foaming agent selected from the group consisting of citric acid, urea, glycine, hydrazine, sucrose, carbohydrazide, oxalyl dihydrazide, sugars, alcohols, and combinations thereof.

83. The method of claim 82 wherein the foaming agent comprises citric acid.

84. The method of claim 81 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 150°C and about 1200°C.

85. The method of claim 81 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 200°C and about 700°C.

86. The method of claim 81 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 250°C and about 650°C.

87. The method of claim 81 wherein the precursors are sprayed to form an aerosol prior to combustion.

88. The method of claim 81 wherein the combusting comprises contacting the precursors with a heated surface.

89. The method of claim 78 wherein the sulfiding is done by exposing the catalyst to a sulfur-containing compound selected from the group consisting of thiophene, hydrogen sulfide, a mercaptan and combinations thereof.

90. The method of claim 78 wherein the sulfiding is done prior to the contacting step.

91. The method of claim 78 wherein the sulfiding is done with the contacting step.

92. The method of claim 78 wherein the catalyst has a cross-sectional dimension of less than about 100 microns.

93. The method of claim 78 wherein the catalyst has a cross-sectional dimension of less than about 30 microns.

94. The method of claim 78 wherein the catalyst has a bulk density less than about 0.3 g/cm^3.

95. The method of claim 78 wherein the catalyst has a bulk density less than about 0.1 g/cm^3.

96. The method of claim 78 further comprising reducing the metal prior to the contacting step.

97. The method of claim 96 wherein the reducing is done with a reducing gas.

98. The method of claim 97 wherein the reducing gas comprises hydrogen.

99. The method of claim 78 wherein the metal is reduced during the contacting step.

100. The method of claim 78 wherein the temperature is in a range of about 500°C and about 1500°C.

101. The method of claim 78 wherein the temperature is in the range of about 650°C and about 950°C.

102. The method of claim 78 wherein the temperature is in the range of about 800°C and about 950°C.

103. The method of claim 78 wherein the carbon-containing feedstock comprises a compound selected from the group consisting of methane, hydrocarbons, carbon monoxide and combinations thereof.

104. The method of claim 78 wherein the gaseous stream comprising the carbon-containing feedstock comprises methane.

105. The method of claim 78 further comprising mixing hydrogen with the gasesous stream comprising carbon-containing feedstock.

106. The method of claim 78 wherein the gaseous stream comprising the carbon-containing feedstock also comprises hydrogen.

107. The method of claim 78 wherein the gaseous stream comprising the carbon-containing feedstock comprises a mixture of methane and hydrogen.

108. The method of claim 78 wherein the contact time is in a range of about 0.1 seconds and about 60 minutes.

109. The method of claim 78 wherein the contact time is in a range of about 0.1 seconds and about 30 minutes.

110. The method of claim 78 wherein the contact time is in a range of about 10 seconds and about 10 minutes.

111. The method of claim 78 wherein the single-wall carbon nanotubes have diameters controlled by the contact time in the contacting step.

112. The method of claim 78 wherein the single-wall carbon nanotubes have lengths controlled by the contact time in the contacting step.

113. The method of claim 78 wherein the contacting is done at a pressure between about 0.1 atmospheres and about 200 atmospheres.

114. The method of claim 78 further comprising removing the catalyst from the carbon product with an acid.

115. The method of claim 114 wherein the acid is selected from the group consisting of citric acid, acetic acid, nitric acid, sulfuric acid, hydrochloric acid, hydrofluoric acid and combinations thereof.

116. The method of claim 114 wherein the acid comprises hydrochloric acid.

117. The method of claim 78 wherein at least about 50 wt% of carbon in the carbon product is single-wall carbon nanotubes.

118. The method of claim 78 wherein at least about 80 wt% of carbon in the product is single-wall carbon nanotubes.

119. The method of claim 78 wherein at least about 90 wt% of carbon in the product is single-wall carbon nanotubes.

120. The method of claim 78 wherein at least about 95 wt% of carbon in the product is single-wall carbon nanotubes.

121. The method of claim 78 wherein the catalyst is flowed through a transport reactor entrained in the gaseous stream comprising the carbon-containing feedstock.

122. The method of claim 121 wherein at least one other gaseous stream comprising the carbon-containing feedstock is introduced to the reactor at more than one inlet.

123. The method of claim 122 wherein the at least one other gaseous stream comprises hydrogen.

124. The method of claim 121 wherein the reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

125. The method of claim 121 wherein the reactor further comprises a solid-gas separator selected from the group consisting of a wet scrubber, a cyclone, an electrostatic precipitator, filter, and combinations thereof.

126. The method of claim 121 wherein a dispersing aid is used in the transport reactor.

127. The method of claim 126 wherein the dispersing aid is a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

128. The method of claim 78 wherein the catalyst is fluidized by the gaseous stream comprising the carbon-containing feedstock in a fluidized bed reactor.

129. The method of claim 128 wherein the fluidized bed reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

130. The method of claim 128 wherein a fluidizing aid is fluidized in the fluidized bed reactor.

131. The method of claim 130 wherein the catalyst and the carbon product are separated from the fluidizing aid by differential elutriation.

132. The method of claim 130 wherein the fluidizing aid exchanges heat with the catalyst.

133. The method of claim 130 wherein the fluidizing aid acts as a reactor wall scrubber.

134. The method of claim 130 wherein the fluidizing aid is a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

135. The method of claim 78 wherein the contacting occurs in a moving bed reactor, wherein the reactor has a moving bed comprising the catalyst and essentially-inert particles.

136. The method of claim 135 wherein the moving bed reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

137. The method of claim 135 wherein the gaseous stream comprising the carbon-containing feedstock is introduced into the reactor at more than one inlet.

138. The method of claim 135 wherein the essentially-inert particles comprise a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

139. The method of claim 135 wherein the essentially-inert particles are removed from the reactor, circulated and re-introduced to the reactor.

140. The method of claim 135 where the essentially-inert particles are regenerated after exiting the reactor.

141. The method of claim 135 wherein the essentially-inert particles are heated after exiting the reactor to produce essentially-inert heated particles.

142. The method of claim 135 wherein the essentially-inert heated particles are introduced into the reactor and exchange heat with the catalyst.

143. The method of claim 135 further comprising separating the catalyst and the carbon product from the essentially-inert particles.

144. The method of claim 143 wherein the separating is done by differential elutriation.

145. The method of claim 143 wherein the separating comprises a component selected from the group consisting of a cyclone, a classifier, a solid-gas separator, a disengaging section, a wet scrubber, a cyclone, an electrostatic precipitator, a filter and combinations thereof.

146. The method of claim 135 wherein the moving bed reactor is a counter-current moving bed reactor, wherein the counter-current moving bed reactor has a moving bed comprising the essentially-inert particles that move in a direction counter-current to flows of the catalyst and the gaseous stream comprising the carbon-containing feedstock.

147. The method of claim 135 wherein the moving bed reactor is a concurrent-flow moving bed reactor wherein the essentially-inert particles and the catalyst flow in the same direction.

148. The method of claim 147 wherein the gaseous stream comprising the carbon-containing feedstock, the essentially inert particles and the catalyst flow in the same direction.

149. The method of claim 148 wherein the gaseous stream comprising the carbon-containing feedstock flows in an opposite direction to movement of the essentially-inert particles and the catalyst.

150. A method for producing single-wall carbon nanotubes, comprising:

(a) providing a catalyst of catalytic metal comprising cobalt and molybdenum on magnesium oxide particles;

(b) sulfiding the catalyst; and

(c) contacting the catalyst with a gaseous stream comprising a carbon-containing feedstock at a sufficient temperature and for a contact time sufficient to make a carbon product comprising single-wall carbon nanotubes.

151. The method of claim 150 wherein the catalyst is prepared by combusting precursors of the catalytic metal and the magnesium oxide particles.

152. The method of claim 151 wherein the precursors are combined with a foaming agent selected from the group consisting of citric acid, urea, glycine, hydrazine, sucrose, carbohydrazide, oxalyl dihydrazide, sugars, alcohols, and combinations thereof.

153. The method of claim 152 wherein the foaming agent comprises citric acid.

154. The method of claim 151 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 150°C and about 1200°C.

155. The method of claim 151 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 200°C and about 700°C.

156. The method of claim 151 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 250°C and about 650°C.

157. The method of claim 151 wherein the precursors are sprayed to form an aerosol prior to combustion.

158. The method of claim 151 wherein the combusting comprises contacting the precursors with a heated surface.

159. The method of claim 150 wherein the sulfiding is done by exposing the catalyst to a sulfur-containing compound selected from the group consisting of thiophene, hydrogen sulfide, a mercaptan and combinations thereof.

160. The method of claim 150 wherein the sulfiding is done prior to the contacting step.

161. The method of claim 150 wherein the sulfiding is done with the contacting step.

162. The method of claim 150 wherein the catalyst has a cross-sectional dimension of less than about 100 microns.

163. The method of claim 150 wherein the catalyst has a cross-sectional dimension of less than about 30 microns.

164. The method of claim 150 wherein the catalyst has a bulk density less than about 0.3 g/cm^3.

165. The method of claim 150 wherein the catalyst has a bulk density less than about 0.1 g/cm^3.

166. The method of claim 150 further comprising reducing the metal prior to the contacting step.

167. The method of claim 166 wherein the reducing is done with a reducing gas.

168. The method of claim 167 wherein the reducing gas comprises hydrogen.

169. The method of claim 150 wherein the metal is reduced during the contacting step.

170. The method of claim 150 wherein the temperature is in a range of about 500°C and about 1500°C.

171. The method of claim 150 wherein the temperature is in the range of about 650°C and about 950°C.

172. The method of claim 150 wherein the temperature is in the range of about 800°C and about 950°C.

173. The method of claim 150 wherein the carbon-containing feedstock comprises a compound selected from the group consisting of methane, hydrocarbons, carbon monoxide and combinations thereof.

174. The method of claim 150 wherein the gaseous stream comprising the carbon-containing feedstock comprises methane.

175. The method of claim 150 further comprising mixing hydrogen with the gasesous stream comprising carbon-containing feedstock.

176. The method of claim 150 wherein the gaseous stream comprising the carbon-containing feedstock also comprises hydrogen.

177. The method of claim 150 wherein the gaseous stream comprising the carbon-containing feedstock comprises a mixture of methane and hydrogen.

178. The method of claim 150 wherein the contact time is in a range of about 0.1 seconds and about 60 minutes.

179. The method of claim 150 wherein the contact time is in a range of about 0.1 seconds and about 30 minutes.

180. The method of claim 150 wherein the contact time is in a range of about 10 seconds and about 10 minutes.

181. The method of claim 150 wherein the single-wall carbon nanotubes have diameters controlled by the contact time in the contacting step.

182. The method of claim 150 wherein the single-wall carbon nanotubes have lengths controlled by the contact time in the contacting step.

183. The method of claim 150 wherein the contacting is done at a pressure between about 0.1 atmospheres and about 200 atmospheres.

184. The method of claim 150 further comprising removing the catalyst from the carbon product with an acid.

185. The method of claim 184 wherein the acid is selected from the group consisting of citric acid, acetic acid, nitric acid, sulfuric acid, hydrochloric acid, hydrofluoric acid and combinations thereof.

186. The method of claim 184 wherein the acid comprises hydrochloric acid.

187. The method of claim 150 wherein at least about 50 wt% of carbon in the carbon product is single-wall carbon nanotubes.

188. The method of claim 150 wherein at least about 80 wt% of carbon in the product is single-wall carbon nanotubes.

189. The method of claim 150 wherein at least about 90 wt% of carbon in the product is single-wall carbon nanotubes.

190. The method of claim 150 wherein at least about 95 wt% of carbon in the product is single-wall carbon nanotubes.

191. The method of claim 150 wherein the catalyst is flowed through a transport reactor entrained in the gaseous stream comprising the carbon-containing feedstock.

192. The method of claim 191 wherein at least one other gaseous stream comprising the carbon-containing feedstock is introduced to the reactor at more than one inlet.

193. The method of claim 192 wherein the at least one other gaseous stream comprises hydrogen.

194. The method of claim 191 wherein the reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

195. The method of claim 191 wherein the reactor further comprises a solid-gas separator selected from the group consisting of a wet scrubber, a cyclone, an electrostatic precipitator, filter, and combinations thereof.

196. The method of claim 191 wherein a dispersing aid is used in the transport reactor.

197. The method of claim 196 wherein the dispersing aid is a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

198. The method of claim 150 wherein the catalyst is fluidized by the gaseous stream comprising the carbon-containing feedstock in a fluidized bed reactor.

199. The method of claim 198 wherein the fluidized bed reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

200. The method of claim 198 wherein a fluidizing aid is fluidized in the fluidized bed reactor.

201. The method of claim 200 wherein the catalyst and the carbon product are separated from the fluidizing aid by differential elutriation.

202. The method of claim 200 wherein the fluidizing aid exchanges heat with the catalyst.

203. The method of claim 200 wherein the fluidizing aid acts as a reactor wall scrubber.

204. The method of claim 200 wherein the fluidizing aid is a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

205. The method of claim 150 wherein the contacting occurs in a moving bed reactor, wherein the reactor has a moving bed comprising the catalyst and essentially-inert particles.

206. The method of claim 205 wherein the moving bed reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

207. The method of claim 205 wherein the gaseous stream comprising the carbon-containing feedstock is introduced into the reactor at more than one inlet.

208. The method of claim 205 wherein the essentially-inert particles comprise a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

209. The method of claim 205 wherein the essentially-inert particles are removed from the reactor, circulated and re-introduced to the reactor.

210. The method of claim 205 where the essentially-inert particles are regenerated after exiting the reactor.

211. The method of claim 205 wherein the essentially-inert particles are heated after exiting the reactor to produce essentially-inert heated particles.

212. The method of claim 205 wherein the essentially-inert heated particles are introduced into the reactor and exchange heat with the catalyst.

213. The method of claim 205 further comprising separating the catalyst and the carbon product from the essentially-inert particles.

214. The method of claim 213 wherein the separating is done by differential elutriation.

215. The method of claim 213 wherein the separating comprises a component selected from the group consisting of a cyclone, a classifier, a solid-gas separator, a

disengaging section, a wet scrubber, a cyclone, an electrostatic precipitator, a filter and combinations thereof.

216. The method of claim 205 wherein the moving bed reactor is a counter-current moving bed reactor, wherein the counter-current moving bed reactor has a moving bed comprising the essentially-inert particles that move in a direction counter-current to flows of the catalyst and the gaseous stream comprising the carbon-containing feedstock.

217. The method of claim 205 wherein the moving bed reactor is a concurrent-flow moving bed reactor wherein the essentially-inert particles and the catalyst flow in the same direction.

218. The method of claim 217 wherein the gaseous stream comprising the carbon-containing feedstock, the essentially inert particles and the catalyst flow in the same direction.

219. The method of claim 217 wherein the gaseous stream comprising the carbon-containing feedstock flows in an opposite direction to movement of the essentially-inert particles and the catalyst.

220. A method for producing single-wall carbon nanotubes, comprising:

(a) providing a supported catalyst comprising at least one metal from the group consisting of Group VIB and Group VIIIB;

(b) feeding the supported catalyst, a carrier gas, and a carbon-containing feedstock gas to a reactor, wherein the supported catalyst, the carrier gas, and the carbon-containing feedstock gas generally flow through the reactor in substantially the same direction; and

(c) contacting the catalyst with the carbon-containing feedstock in the reactor at a sufficient temperature and for a contact time sufficient to make single-wall carbon nanotubes.

221. A method for producing single-wall carbon nanotubes, comprising:

(a) providing a supported catalyst comprising at least one metal from the group consisting of Group VIB and Group VIIIB;

(b) feeding the supported catalyst, a carrier gas, a carbon-containing feedstock gas, and fluidizing aid particles to a fluidized bed reactor;

(c) contacting the catalyst with the carbon-containing feedstock in the reactor at a sufficient temperature and for a contact time sufficient to make single-wall carbon nanotubes;

(d) withdrawing an upper product stream from the reactor that comprises single-wall carbon nanotubes; and

(e) separately withdrawing a lower product stream from the reactor that comprises fluidizing aid particles.

222. The method of claim 221 wherein the fluidizing aid particles from step (e) are recycled to the reactor.

223. The method of claim 222 wherein the fluidizing aid particles are heated before being recycled to the reactor.

224. A method for producing single-wall carbon nanotubes, comprising:

(a) providing a supported catalyst comprising at least one metal from the group consisting of Group VIB and Group VIIIB;

(b) continuously feeding the supported catalyst, a carrier gas, a carbon-containing feedstock gas, and fluidizing aid particles to a reactor, wherein the fluidizing aid particles flow generally counter-current to the carrier gas and carbon-containing feedstock gas in the reactor;

(c) contacting the catalyst with the carbon-containing feedstock in the reactor at a sufficient temperature and for a contact time sufficient to make single-wall carbon nanotubes;

(d) withdrawing an upper product stream from the reactor that comprises single-wall carbon nanotubes; and

(e) separately withdrawing a lower product stream from the reactor that comprises fluidizing aid particles.

225. The method of claim 224 wherein the fluidizing aid particles from step (e) are recycled to the reactor.

226. The method of claim 225 wherein the fluidizing aid particles are heated before being recycled to the reactor.

227. A method for producing single-wall carbon nanotubes, comprising:

(a) providing a supported catalyst comprising at least one metal from the group consisting of Group VIB and Group VIIIB;

(b) continuously feeding the supported catalyst, a carrier gas, a carbon-containing feedstock gas, and fluidizing aid particles to a reactor, wherein the fluidizing aid particles generally flow in substantially the same direction as the carrier gas and carbon-containing feedstock gas in the reactor;

(c) contacting the catalyst with the carbon-containing feedstock in the reactor at a sufficient temperature and for a contact time sufficient to make single-wall carbon nanotubes;

(d) withdrawing an product stream from the reactor that comprises single-wall carbon nanotubes, and fluidizing aid particles; and

(e) separating the single-wall carbon nanotubes from the fluidizing aid particles.

228. The method of claim 227 wherein the fluidizing aid particles from step (e) are recycled to the reactor.

229. The method of claim 228 wherein the fluidizing aid particles are heated before being recycled to the reactor.

230. A method for producing carbon nanotubes, comprising:

(a) providing a supported catalyst comprising refractory particles and at least one or more catalytic metal selected from the group consisting of Group VIIIB, Group VIB and combinations thereof; and

(b) contacting the catalyst with a gaseous stream comprising a carbon-containing feedstock at a sufficient temperature and for a contact time sufficient to make a carbon product comprising carbon nanotubes.

231. The method of claim 230 wherein the carbon nanotubes are selected from the group consisting of multiwall carbon nanotubes, single-wall carbon nanotubes and a combination thereof.

232. The method of claim 230 wherein the catalytic metal comprises metals from both Group VIIIB and Group VIB and wherein the Group VIIIB metal and the Group VIB metal have a weight ratio in the range of about 10 to 1 to about 2 to 1.

233. The method of claim 230 wherein the catalytic metal comprises metals from both Group VIIIB and Group VIB and wherein the Group VIIIB metal and the Group VIB metal have a molar ratio in the range of about 20 to 1 to about 3 to 1.

234. The method of claim 230 wherein the catalytic metal is are present on the refractory particles at a loading in the range of about 0.5 wt% and about 10 wt% of the weight of the refractory particles.

235. The method of claim 230 wherein the catalyst is prepared by a combusting a combination of Group VIIIB metal precursors, Group VIB metal precursors and refractory particle precursors.

236. The method of claim 235 wherein the Group VIIIB metal precursor is selected from a Group VIIIB-containing compound wherein the compound is selected the group consisting of a nitrate, a sulfite, a sulfate, a carbonate, an acetate, a citrate, a gluconate, a hexacyanoferrite, an oxalate, a tris(ethylenediamine) sulfate and combinations thereof.

237. The method of claim 235 wherein the Group VIB metal precursor is a Group VI-containing compound wherein the compound is an ammonium compound.

238. The method of claim 235 wherein the refractory particle precursor is a nitrate compound.

239. The method of claim 235 wherein the combusting includes a foaming agent.

240. The method of claim 239 wherein the foaming agent selected from the group consisting of citric acid, urea, glycine, hydrazine, sucrose, carbohydrazide, oxalyl dihydrazide, sugars, alcohols, and combinations thereof.

241. The method of claim 239 wherein the foaming agent comprises citric acid.

242. The method of claim 235 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 150°C and about 1200°C.

243. The method of claim 235 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 200°C and about 700°C.

244. The method of claim 235 wherein the combusting is conducted by exposing the precursors to temperatures in the range of about 250°C and about 650°C.

245. The method of claim 235 wherein the precursors are sprayed to form an aerosol prior to combustion.

246. The method of claim 235 wherein the combusting comprises contacting the precursors with a heated surface.

247. The method of claim 230 further comprising sulfiding the catalyst wherein the catalyst is exposed to a sulfur-containing compound.

248. The method of claim 247 wherein the sulfur-containing compound is selected from the group consisting of thiophene, hydrogen sulfide, a mercaptan and combinations thereof.

249. The method of claim 247 wherein the sulfur-containing compound comprises thiophene.

250. The method of claim 247 wherein the sulfiding is done prior to the contacting step.

251. The method of claim 247 wherein the sulfiding is done with the contacting step.

252. The method of claim 230 wherein the catalyst has a cross-sectional dimension of less than about 100 microns.

253. The method of claim 230 wherein the catalyst has a cross-sectional dimension of less than about 30 microns.

254. The method of claim 230 wherein the catalyst has a bulk density less than about 0.3 g/cm^3.

255. The method of claim 230 wherein the catalyst has a bulk density less than about 0.1 g/cm^3.

256. The method of claim 230 further comprising reducing the metal prior to the contacting step.

257. The method of claim 256 wherein the reducing is done with a reducing gas.

258. The method of claim 257 wherein the reducing gas comprises hydrogen.

259. The method of claim 230 wherein the metal is reduced during the contacting step.

260. The method of claim 230 wherein the temperature is in a range of about 500°C and about 1500°C.

261. The method of claim 230 wherein the temperature is in the range of about 650°C and about 950°C.

262. The method of claim 230 wherein the temperature is in the range of about 800°C and about 950°C.

263. The method of claim 230 wherein the carbon-containing feedstock comprises a compound selected from the group consisting of methane, hydrocarbons, carbon monoxide and combinations thereof.

264. The method of claim 230 wherein the gaseous stream comprising the carbon-containing feedstock comprises methane.

265. The method of claim 230 further comprising mixing hydrogen with the gasesous stream comprising carbon-containing feedstock.

266. The method of claim 230 wherein the gaseous stream comprising the carbon-containing feedstock also comprises hydrogen.

267. The method of claim 230 wherein the gaseous stream comprising the carbon-containing feedstock comprises a mixture of methane and hydrogen.

268. The method of claim 230 further comprising mixing an oxidizing gas with gaseous stream comprising the carbon-containing feedstock.

269. The method of claim 268 wherein the oxidizing gas is selected from the group consisting of oxygen, water vapor, carbon dioxide and combinations thereof.

270. The method of claim 230 wherein the contact time is in a range of about 0.1 seconds and about 60 minutes.

271. The method of claim 230 wherein the contact time is in a range of about 0.1 seconds and about 30 minutes.

272. The method of claim 230 wherein the contact time is in a range of about 10 seconds and about 10 minutes.

273. The method of claim 230 wherein the single-wall carbon nanotubes have diameters controlled by the contact time in the contacting step.

274. The method of claim 230 wherein the single-wall carbon nanotubes have lengths controlled by the contact time in the contacting step.

275. The method of claim 230 wherein the contacting is done at a pressure between about 0.1 atmospheres and about 200 atmospheres.

276. The method of claim 230 further comprising removing the catalyst from the carbon product with an acid.

277. The method of claim 276 wherein the acid is selected from the group consisting of citric acid, acetic acid, nitric acid, sulfuric acid, hydrochloric acid, hydrofluoric acid and combinations thereof.

278. The method of claim 276 wherein the acid comprises hydrochloric acid.

279. The method of claim 230 wherein at least about 50 wt% of carbon in the carbon product is single-wall carbon nanotubes.

280. The method of claim 230 wherein at least about 80 wt% of carbon in the product is single-wall carbon nanotubes.

281. The method of claim 230 wherein at least about 90 wt% of carbon in the product is single-wall carbon nanotubes.

282. The method of claim 230 wherein at least about 95 wt% of carbon in the product is single-wall carbon nanotubes.

283. The method of claim 230 wherein the catalyst is flowed through a transport reactor entrained in the gaseous stream comprising the carbon-containing feedstock.

284. The method of claim 283 wherein at least one other gaseous stream comprising the carbon-containing feedstock is introduced to the reactor at more than one inlet.

285. The method of claim 284 wherein the at least one other gaseous stream comprises hydrogen.

286. The method of claim 283 wherein the reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

287. The method of claim 283 wherein the reactor further comprises a solid-gas separator selected from the group consisting of a wet scrubber, a cyclone, an electrostatic precipitator, filter, and combinations thereof.

288. The method of claim 283 wherein a dispersing aid is used in the transport reactor.

289. The method of claim 288 wherein the dispersing aid is a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

290. The method of claim 230 wherein the catalyst is fluidized by the gaseous stream comprising the carbon-containing feedstock in a fluidized bed reactor.

291. The method of claim 290 wherein the fluidized bed reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

292. The method of claim 290 wherein a fluidizing aid is fluidized in the fluidized bed reactor.

293. The method of claim 292 wherein the catalyst and the carbon product are separated from the fluidizing aid by differential elutriation.

294. The method of claim 292 wherein the fluidizing aid exchanges heat with the catalyst.

295. The method of claim 292 wherein the fluidizing aid acts as a reactor wall scrubber.

296. The method of claim 292 wherein the fluidizing aid is a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

297. The method of claim 230 wherein the contacting occurs in a moving bed reactor, wherein the reactor has a moving bed comprising the catalyst and essentially-inert particles.

298. The method of claim 297 wherein the moving bed reactor comprises more than one zone wherein each zone is capable of maintaining a different set of reaction conditions.

299. The method of claim 297 wherein the gaseous stream comprising the carbon-containing feedstock is introduced into the reactor at more than one inlet.

300. The method of claim 297 wherein the essentially-inert particles comprise a material selected from the group consisting of metal oxide particles, sand, quartz beads, ceramic particles, refractory material and combinations thereof.

301. The method of claim 297 wherein the essentially-inert particles are removed from the reactor, circulated and re-introduced to the reactor.

302. The method of claim 297 where the essentially-inert particles are regenerated after exiting the reactor.

303. The method of claim 297 wherein the essentially-inert particles are heated after exiting the reactor to produce essentially-inert heated particles.

304. The method of claim 297 wherein the essentially-inert heated particles are introduced into the reactor and exchange heat with the catalyst.

305. The method of claim 297 further comprising separating the catalyst and the carbon product from the essentially-inert particles.

306. The method of claim 305 wherein the separating is done by differential elutriation.

307. The method of claim 305 wherein the separating comprises a component selected from the group consisting of a cyclone, a classifier, a solid-gas separator, a disengaging section, a wet scrubber, a cyclone, an electrostatic precipitator, a filter and combinations thereof.

308. The method of claim 297 wherein the moving bed reactor is a counter-current moving bed reactor, wherein the counter-current moving bed reactor has a moving bed comprising the essentially-inert particles that move in a direction counter-current to flows of the catalyst and the gaseous stream comprising the carbon-containing feedstock.

309. The method of claim 297 wherein the moving bed reactor is a concurrent-flow moving bed reactor wherein the essentially-inert particles and the catalyst flow in the same direction.

310. The method of claim 309 wherein the gaseous stream comprising the carbon-containing feedstock, the essentially inert particles and the catalyst flow in the same direction.

311. The method of claim 309 wherein the gaseous stream comprising the carbon-containing feedstock flows in an opposite direction to movement of the essentially-inert particles and the catalyst.